ASPECTS OF ASTRONOMY.

AT the anniversary meeting of the Royal Astronomical Society on February 11, the gold medal of the society was presented to Prof. Friedrich Küstner, director of the Royal Observatory, Bonn, for his catalogue of stars, his pioneer determination of the aberration constant from motions in the line of sight, and his detection of the variation of latitude. In his address as president of the society, Sir David Gill described the valuable work done by Prof. Küstner in each of these directions. He prefaced his remarks by saying:—

> Astronomy in one sense or another appeals to minds of widely different orders. To the mathematician it offers problems of infinite interest; but, as we all know, there have been most distinguished workers in the field of astrodynamics to whom the spectacular glories of the heavens do not appeal—to whom the first sight of an object like Saturn or a great star cluster as viewed through a good telescope brings no thrill, no insatiable desire to see more or to acquire or devise means for so doing. Such men are too apt to regard the art of observing as a mere mechanical operation that is unworthy of their practical study; but they are thus frequently placed in the position of having to employ observations about which they have not the capacity to distinguish between the good and the bad.
>
> There is a larger number of persons who are not wanting in the emotional response to their first telescopic sight of celestial objects; some of these acquire, or are driven to construct, instruments to indulge their awakened curiosity, and not a few of them afterwards do useful work as astronomical observers.
>
> The attributes of the great majority of astronomers lie between these two extremes; but the number of men who possess the true fire and natural capacity for the most refined original research in the field of astrometry is limited. Such men must have an inborn natural mathematical, mechanical, and manipulative aptitude; the critical faculty to discern the possible sources of error to which any class of observations may be liable, with the inventive capacity to devise means for their elimination; and that persistent patience and divine discontent with their own best efforts which alone can lead to the highest and most refined class of work.

NOTES.

THE following telegram from the Paris correspondent of the *Times* appeared in the issue of that journal for February 16:—"Paris, February 15.—According to a communication made yesterday to the Academy of Sciences by M. Lippmann, Mme. Pierre Curie, the widow of M. Pierre Curie, the discoverer of polonium and radium, has at last succeeded in isolating one-tenth of a milligram of polonium. In order to obtain this result, Mme. Curie, working in cooperation with M. Debierne, has had to treat several tons of pitchblende with hot hydrochloric acid. The radio-active properties of polonium turn out to be far greater than those of radium. It decomposes chemically organic bodies with extraordinary rapidity. When it is placed in a vase made of quartz, which is one of the most refractory of substances, it cracks the vessel in a very short time. But a no less distinctive quality of polonium is the comparatively rapid rate at which it disappears. Whereas it takes one thousand years for radium to disappear completely, a particle of polonium loses 50 per cent. of its weight in 140 days. The products of its disintegration are helium and another body, the nature of which has not yet been ascertained, but Mme. Curie and M. Debierne are inclined to believe it to be lead. Its identity, however, will shortly be established, and at the same time science will have had the experimental proof of the transformation of a body which had been believed to be elementary."

WE learn from the Paris correspondent of the *Chemist and Druggist* that the administrative council of the Pasteur Institute has decided to establish a laboratory for the study of radio-activity and its therapeutic applications. This laboratory will adjoin the Oceanographic Institute there. The Pasteur Institute will devote to this object 400,000 francs of the Osiris Legacy. The University of Paris will give the land and find the rest of the money. Mme. Curie will be directress of the physical side of the laboratory, and the other section (researches as to practical applications of radio-therapy) will be under the direction of the Pasteur Institute. On a neighbouring site an extensive institute of chemistry is to be erected at the joint cost of the State, the city of Paris, and the Paris University.

A COMMITTEE has been formed with the view of promoting investigations into the nature and etiology of pellagra, a lethal disease which has become a terrible scourge in some countries of southern Europe and in many tropical or subtropical regions in other parts of the globe. The generally accepted notion is that the disease is caused by damaged maize; Dr. Sambon has, however, brought forward cogent reasons for regarding this theory as inadequate, and has pointed out that the seasonal prevalence and distribution of pellagra are compatible with its being a protozoal disease, which is spread by the agency of blood-sucking insects, probably sand-flies. It is intended to send Dr. Sambon, accompanied by properly qualified assistants, to a pellagrous region to carry on investigations on the etiology of the disease, and for this purpose it is hoped to raise a fund of 1000*l.*, towards which several subscriptions have been received, including a sum of 150*l.* from the Colonial Office.

ALL English chemists will join with their German colleagues in offering their congratulations to Prof. Julius Wilhelm Brühl on his sixtieth birthday, which he celebrated on Sunday last. Prof. Brühl's contributions to chemical science range over the whole of the subject. His first paper, on the substitution amido- and phosphido-acids, was published in 1875, and from that year, almost up to the present, his work exhibits an almost unequalled activity. During the last thirty-five years no fewer than ninety papers have been published by this extremely energetic chemist, and it is worthy of note that, with few exceptions, they are a record of his own personal work. A paper published in 1881, on the relations of the physical properties of bodies and their chemical constitution, was the first of a long series of contributions on a part of chemistry in which Brühl stands pre-eminent. Those who were privileged to be present at the lecture he delivered in London in 1905 will remember the excellent summary he gave, in faultless English, of his work on molecular refractivity. One paper, in the domain of pure inorganic chemistry, deserves special mention as illustrating the all-round character of his work. In this research, published in 1895, hydrogen dioxide was first prepared in a pure condition, its formula was for the first time established, and its physical properties determined. Prof. Brühl has very many friends in this country; indeed, it is scarcely too much to say that all who have met him, at the British Association and elsewhere, are his friends. He has a great love for this country, and an unprejudiced respect for the achievements of her men of science. All will be glad to know that he is recovering from the severe illness which has crippled his activity for the last two years, and hope that his renewed health will enable him to add still more to our knowledge of the most difficult and perhaps the most interesting problems in chemical science.

THE first fertilised eggs of the plaice for the hatching season of 1910 were skimmed from the spawning pond of the Port Erin Hatchery on February 14.

THE Dutch Government is reported to have voted the sum of half a million francs for the erection of a new institute of physical and mineral chemistry, to be under the direction of Prof. F. M. Jaeger, of the University of Groningen.

PROF. J. D. VAN DER WAALS, of the University of Amsterdam, has been elected a foreign associate member of the Paris Academy of Sciences. Prof. Van der Waals has been a correspondant of the academy since 1900.

THE French Physical Chemistry Society has elected the following officers for the present year:—President, Prof. G. Urbain, of the University of Paris; vice-president, M. L. Lapicque, of the same university; treasurer, M. A. Brochet; secretary, M. Ch. Marie.

WE note with regret that the *Revue scientifique* announces the deaths of Prof. H. Dufour, professor of experimental physics and meteorology in the University of Lausanne, and of Prof. Karl Gottsche, director of the Hamburg Institute of Mineralogy and Geology.

IT is announced in *Science* that funds have been raised by public subscription for the establishment of an astronomical observatory at Kamuki, Honolulu, to be used in the first instance for observations of Halley's comet. The observatory, however, will be permanent, and under control of the College of Hawaii.

PROF. G. H. F. NUTTALL, F.R.S., Quick professor of biology in the University of Cambridge, has been awarded the Mary Kingsley Medal by the Liverpool School of Tropical Medicine. The medal is awarded "from time to time to those who have distinguished themselves in research in tropical medicine and allied subjects."

AN International Congress on the Administrative Sciences will be held at Brussels on July 27–31, in the grounds of the International Exhibition. The Secretary to the British committee is Mr. G. Montagu Harris, Caxton House, Westminster, from whom further particulars may be obtained.

THE annual meeting of the British Science Guild will be held at the Mansion House on Friday, March 18, at 4 p.m. Arrangements have been made for the fellows and members of the Guild to dine together at Prince's Hall, Piccadilly, on Friday, May 6. Mr. Haldane, the president of the Guild, will occupy the chair.

A TELEGRAM was received at Utrecht on February 14 from Mr. H. A. Lorentz, stating that his expedition having the object of penetrating into Central New Guinea from the south coast has been entirely successful. Mr. Lorentz reached the snow-capped range which had previously only been perceived dimly from the distance; he has climbed in these Alpine regions, and has discovered glaciers at an altitude of 15,000 feet. One of the last geographical secrets of the tropical regions has thus been opened, and exploration in detail will no doubt follow.

SPEAKING at the dinner of the Physical Society on February 8, Dr. Chree, president of the society, referred to the work of the society and to its increasing activity. The number of papers read before the society has become much larger of recent years, but he thinks there may be some improvement in the presentation of such papers. Generally speaking, there are three ways in which an author may be congratulated:—first, on producing valuable results; secondly, on the form in which they are put; and, thirdly, both author and audience may be congratulated when the reading has been accomplished. Of these three, the second is the most rare. Papers usually consist of 25 per cent. due to the author and 75 per cent. of material that preceded the paper. Authors are apt to neglect the 75 per cent., and to assume that the audience know all about it; also, when any mathematics appears in a paper, the author generally proceeds to put it upon the blackboard. This is not desirable, because a physicist's knowledge of mathematics is usually not good, and mathematical results are frequently not of great value. In some ways it would be better for authors to read each other's papers instead of their own. Dr. Chree also thought it would be of great advantage occasionally if the society could have a general discussion of a subject by a physicist well acquainted with that special branch of knowledge.

IN the January number of *Man* Mr. T. A. Joyce describes a remarkable wooden statue brought by Mr. E. Torday from the Kasai district in West Africa. Up to the present the art of portraiture in the round, so far as Africa is concerned, has been supposed to be confined to ancient Egypt. This specimen, however, shows that the art extended to the Bu-Shongo nation. The present statue, which is evidently a portrait, represents the national hero, Shamba Bolongonga, who is said to have been 93rd in the dynasty of rulers, the ruling king at the present day being 121st. The work is in many ways remarkable, the treatment of the collar bones and the swelling curves of the trunk displaying an attempt at realism which hitherto was supposed to be entirely foreign to the African artist. Mr. Torday, who must have displayed considerable tact and enterprise in acquiring a historical relic of this kind, is to be congratulated on his success and on his liberality in presenting such a valuable specimen to the British Museum.

DR. C. HOSE, in *Travel and Exploration* for February, gives an account of his visit to the warlike Madang tribe, occupying a region in Borneo which has up to the present remained unexplored. These people, on account of their raiding propensities, have been a terror to their neighbours; but the visit of Dr. Hose has resulted in an arrangement which will, it is hoped, put a stop to this constant intertribal warfare. It is remarkable that this race judge the fitting season for planting their rice by the sun, and they have invented a curious mode of measuring time. This is a sort of gnomon, consisting of a post about a fathom high, a piece of string weighted at each end and thrown over the top showing when the post is perfectly straight. The length of the shadow is measured by a stick marked with notches gradually approaching one another as they recede from the pole. Having got so far, it may be asked why they have never invented the sun-dial. Dr. Hose explains this by the fact that the present instrument is more efficient, as in these latitudes there are many days near each equinox when a sun-dial would be useless.

AMONG the contents of No. 1 of the *Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg* for 1910 is an illustrated paper, by Mr. E. Nasonow, on the life-history and transformations of *Kermes quercus*.

THE sea-bass (Serranidæ) of Japan form the subject of an article, by Messrs. D. S. Jordan and R. E. Richardson, published as No. 1714 of the Proceedings of the U.S. National Museum. A new species of the large genus Epinephelus is described.

WE are indebted to the authors, the Rev. C. E. Y. Kendall and Messrs. J. D. Dean and W. M. Rankin, for a copy of a paper on the geographical distribution of molluscs in South Lonsdale, reprinted from the *Yorkshire Naturalist* for last year. The dependence of the distribution of the various species on station, geological formation, &c., is fully indicated.

IN the Proceedings of the Academy of Natural Sciences of Philadelphia for November, 1909, Messrs. H. A. Pilsbry and J. H. Ferriss continue their account of the land and fresh-water molluscs of the south-western States, dealing in this instance with the fauna of the Huachuca Mountains of Arizona. In the same issue Dr. Pilsbry, this time in association with Mr. A. A. Hinkley, discusses the Melaniidæ of the Panuco River system of Mexico.

THREE Continental insects are added to the British fauna in the *Entomologist's Monthly Magazine* for February, Dr. D. Sharp recording the Mediterranean beetle *Crepidodera impressa* from Hayling Island and *Galerucella pusilla* from the New Forest and elsewhere, while Mr. E. A. Butler chronicles the occurrence of an example of *Cyrtorhinus geminus*, a Scandinavian and Livonian hemipterid, at Broxbourne, and also mentions a second British specimen of the same species preserved in his own collection.

THE January number of the *Museums Journal* contains a summary of the correspondence which has recently appeared in the *Times* with regard to the administration of the natural-history branch of the British Museum. At the conclusion of the summary the opinion is editorially expressed that the director of the natural-history departments should be independent of the director and principal librarian at Bloomsbury. If the separation of the two establishments were carried out, no one, so far as we are aware, has suggested a suitable and adequate title for the one at South Kensington. "Natural History Museum" is obviously insufficient, except when used in connection with this country alone.

AT the commencement of a monographic revision of the Strepsiptera, published as Bulletin No. 66 of the U.S. National Museum, Mr. W. D. Pierce states that he is unable to accept the view that these parasitic insects are modified representatives of the Coleoptera, and accordingly regards them as forming an order by themselves, of which several families, in addition to the typical Stylopidæ, are recognised. In the author's opinion, the Strepsiptera form an order, "on a distinct line of descent from that of the Coleoptera, and nearer the Hymenoptera and Diptera, and as highly specialised as the highest insects in any of the orders." It is remarked that few persons have seen the adult winged males of these insects, although most collectors have marvelled at their portraits in books. The author hopes that the publication of his monograph will lead to a considerable increase in our knowledge of these insects.

TO *Spolia Zeylanica* for December, 1909, vol. vi., p. 108, Dr. A. Willey contributes notes on the nest, eggs, and larvæ of the well-known fish *Ophiocephalus striatus*, locally termed in Ceylon the lula, or marral. The most interesting fact in connection with the breeding-habits of this fish is that the eggs float on the surface of the water by their own buoyancy, a feature apparently unique among fresh-water species. In certain other groups the same advantages, namely, proximity to atmospheric air and exposure to sunlight, are partly gained by the suspension of the eggs to plant-stems, their enclosure in floating nests of herbage or foam, or by their deposition in very shallow water. As regards development, the simple ventral flexure of the embryo of Ophiocephalus, the absence of retinal pigment within the egg, and the formation of the pectoral fins after the larva is hatched, are features contrasting with what prevails among many teleosteans. In these the later appearance of the ventral fins is the rule. In the African and American lung-fishes the two pairs of limbs arise simultaneously, but in the Australian Ceratodus the ventrals appear about a month later than the pectorals, much as in Ophiocephalus.

WE heartily welcome another of those meritorious monographs which the Americans are working up so thoroughly with reference to their own fauna. This time it is a "Monograph of the West American Pyramidellid Molluscks," by W. H. Dall and P. Bartsch (Smithsonian Institution, 1909, Bulletin No. 68). Though titularly devoted to the Pacific coast of the U.S.A., this work will be invaluable to all students of marine gastropods on account of its synopsis of genera and sections, forming a complete key to the systematisation of a most difficult family. It matters very little whether we accept the authors' views as to the status of their subgenera and sections or prefer to regard the majority of them as genera. Certainly many, such as Syrnola, Actæopyramis, Mormula, and Menestho, are generally nowadays accorded the higher rank—no doubt in course of time practically all their groups will be so treated. Meanwhile, Messrs. Dall and Bartsch prefer to restrict the number of recent genera, and admit only three of the four to be found in Fischer's "Manuel de Conchyliologie," Eulimella being subordinated to Pyramidella; the latter has altogether twenty-three named subdivisions, Turbonilla has twenty-four, and Odostomia has forty. So far as concerns our British Pyramidellids, the classification coincides mainly with that adopted in the Conchological Society's latest list (*Jour. of Conch.*, 1901). We note, however, several changes. The names Ondina and Pyrgostelis yield in priority to Evalea and Pyrgiscus, and the latter group, typified by the old *Odostomia rufa*, Phil., is transferred—we think more conveniently and correctly—to Turbonilla. A similar transfer is made of *O. fenestrata*, Forbes, and it is placed in a separate subgenus, Tragula. Pyrgulina is reserved for species with a sculpture of impressed spiral lines, and for our species of the *interstincta* type we must substitute the name Parthenina.

THE latest and concluding number of the ninth volume of the *Bulletin du Jardin Impérial botanique*, St. Petersburg, contains a note, by Mr. J. W. Palibin, relating to the distribution of *Adoxa Moschatellina* in the Caucasus and *Ruppia maritima* in south-eastern Siberia, and an article by Mr. A. A. Elenkin in which he presents a survey of certain species of Anabæna, with special reference to a new species, *Anabaena Scheremetiewi*.

A SECOND contribution of notes on Philippine palms, by Dr. O. Beccari, is published in the botanical section (vol. iv., No. 5) of the *Philippine Journal of Science*. The type of a new species, *Normanbya Merrillii*, is provided by a fine palm which has the habit of *Areca catechu*, and yields a nut suitable for chewing; another new species, *Areca macrocarpa*, also bears comparison with the Areca palm on account of its fruit, which is even larger than the betel-nut. Several new species are placed in the genera Livistona, Korthalsia, Heterospathe, and Pinanga; there are also additions to the climbing palms Calamus and Dæmonorops. The same number of the journal contains a first article, by Mr. O. Ames, on Philippine orchids, and a revision of the native Combretaceæ by Mr. E. D. Merrill.

The useful and general nature of the work carried on in the West Indies under the direction of the Imperial Department of Agriculture is well exemplified in the report presented by the curator of the botanic and experiment stations in the small island of Montserrat. Experiments have been instituted in connection with the important lime-fruit industry to see what results are attained by clean cultivation. The welfare of the peasants receives attention by the provision of help and guidance in cotton cultivation and by the introduction of improved varieties of tannias and cassava, which form a staple article of food. Further, the possibilities of new products are being put to the test in the experimental plots of the wild bay tree *Pimenta acris*, lemon grasses, and *Pilocarpus racemosus*; the two former yield essential oils, while the latter is a source of the drug pilocarpine.

With the object of obtaining information regarding the geotropic sensibilities of stalked Basidiomycetes, Dr. F. Knoll carried out a series of experiments with *Coprinus stiriacus*, which he describes in *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften*, Vienna (vol. cxviii., part v.). A study of the longitudinal growth shows that there is a growing region at the top of the stipe or fruiting stalk where intercalary growth, due entirely to extension of the separate hyphæ, takes place. The stipes, which in the very earliest stage are ageotropic, become later negatively geotropic. Perception of the stimulus and power of response are manifested by the whole of the growing region. The variation noted in the "reaction-period" is remarkable; while the pileus or cap is young an interval of two hours may elapse between the stimulus and response, but when the spores are ripe this period decreases to a few minutes.

Dr. Emil Werth contributes an account of the surface features of Kerguelen Island to the *Zeitschrift* of the Berlin Geographical Society. The paper is, to some extent, an abstract of the author's more complete memoir on Kerguelen published in the report of the German South Polar Expedition, 1901–3; it gives an account of the topography of the island, and discusses its relation to volcanic phenomena, past and present glaciation, and rock weathering.

The December (1909) number of the Bulletin of the American Geographical Society contains an account of some experiments on the artificial formation of deltas, carried out in the laboratory of the geological department of Ohio State University, by Mr. Arthur L. Smith. The experiments produced two general forms of deltas, one with regularly semi-circular outline and one with irregularly lobate outline. It was found that the ultimate form of the first was determined by the maintenance of a constant or increasing stream gradient, and of the second by the decrease of the gradient of the stream. Pronounced cross-bedding was found to occur only in the fore-set layers of the lobate form, and, to a small extent, in all top-set beds. Experiment confirmed the impression, conveyed by an examination of maps of natural deltas, that "fingers" are merely surface features of the delta margin. The shape of a delta is unaffected by the depth of water or irregularities in the bed on which it is formed.

The Kelvingrove Museum in Glasgow, which belongs to the Glasgow Corporation, contains a valuable collection of minerals, including the Glen collection, purchased in 1896, and the Fleming collection, presented in 1902. The museum is rich in the interesting minerals that have been found in the estuary of the Clyde and at other localities in western Scotland. A useful guide to the minerals in this museum has been written by Mr. P. MacNair, the curator of the natural-history collections (Glasgow: Robert Anderson, 1910, price 3*d*.). More than half the work is taken up with an introduction to mineralogy, which is more technical and advanced in its treatment than corresponding guides issued by other museums. It endeavours to carry the reader farther into the details of crystallography than most visitors to an English museum would care to follow, and the index includes many names of little importance; thus in P are Paulite, Pissophanite, Plinthite, and Protheite. The guide concludes with a brief account of the chief mineral species. It is illustrated by a plate of the interesting calcite pseudomorphs, attributed to Gaylussite, that have been dredged from the Clyde estuary.

Statistics of aëronautical patents in recent years are given by Dr. W. A. Dyes in the *Zeitschrift für Luftschiffahrt* for February. The number of complete patents granted in Germany was 73 in 1909, 36 in 1908, 27 in 1907, 14 in 1906. The corresponding numbers of provisional protections were 140, 48, 37, 14. In view of the fact that in Germany applications for patents are not published until the Patent Office has examined their validity, the author gives for comparison the number of applications filed by the English Patent Office in the same years, namely, 776 in 1909, 224 in 1908, 189 in 1907, 43 in 1906, and 19 in 1905.

No better illustration of German progress in aërial navigation could be found than the long list of local aëronautical societies the official notices of which appear in the German *Zeitschrift für Luftschiffahrt*. In addition to the German Luftschiffer Verband, we have "Vereine für Luftschiffahrt" for the following districts:—Berlin, Central Rhenish, Lower Rhenish (sections at Bonn, Düsseldorf, Krefeld, Essen, Wupperthal), Pomeranian, Bremen, Bitterfeld, Lower Saxon, Brunswick, Hamburg, Saxo-Thuringian (with sections for Thuringian States, Erfurt, and Halle), Breisgau, Frankfurt, Anhalt. The Imperial Aëro Club also occurs in this list, which is based on the February number. We have nothing to correspond with these local societies in England. It must, however, be admitted that the hideous and gruesome illustration of "The Aëronaut's Death" in the January number of the *Deutsche Zeitschrift* is a little out of place in a scientific journal.

Dr. F. W. Edridge-Green read a paper on colour-blindness at the Royal Society of Arts on February 9. The paper is an excellent and lucid exposition of his well-known views upon the subject, and as such it will well repay perusal. In its general character his theory is one which is attractive to physiologists, but some of his assumptions require more impeccable evidence than is adduced. We may cite as an example the statement that "the decomposition of the visual purple by light chemically stimulates the ends of the cones (very probably through the electricity which is produced)." His strictures of the tests for colour-blindness in common use have at least sufficient foundation to demonstrate the need for their reconsideration as a part of the reformation of the official examinations.

The November (1909) number of the Bulletin of the Bureau of Standards contains a paper, of nearly fifty pages, on platinum resistance thermometry at high temperatures, by Messrs. C. W. Waidner and G. K. Burgess. They find that temperatures determined on the pure platinum resistance scale standardised at 0°, 100°, and at the boiling point of sulphur, taken as 444·70° C., agree with temperatures on the gas thermometer scale in the interval 0° to 1100° C. within the limits of experimental error of the latter scale. With impure platinum, for which the constant δ of Prof. Callendar's interpolation formula differs from 1·5, the value of δ has to be taken as increasing with temperature by an amount which increases with the degree of impurity before agreement with the gas scale can be secured. With the pure palladium thermometer even this is not sufficient. In neither case is the interpolation formula proposed by Mr. J. D. H. Dickson found suitable. High temperature appears to render the impure platinum purer, possibly by evaporating impurities, as, for example, iridium. The authors consider it desirable that thermometers should be standardised at a fourth point in addition to the three mentioned above, and suggest that the freezing points of metals, even when only commercially pure, are now known with sufficient accuracy, and are so easily reproduced, that they furnish convenient fixed temperatures. They give the following figures for the freezing points:—tin, 231·92°; cadmium, 321·01°; lead, 327·43°; zinc, 419·37°; antimony, 630·71°; aluminium, 658·0°; silver, 960·9°; copper, 1083·0°; the 72 per cent. silver, 28 per cent. copper eutectic, 779·20°.

H.M.S. *Collingwood*, the latest of our Dreadnought battleships, has just completed her official steam, gunnery, and torpedo trials, a brief account of which appears in the *Engineer* for February 11. The *Collingwood* is the sixth ship of her class floated, and was launched from Devonport Dockyard on November 7, 1908. The machinery is of the Parsons turbine type, and there are two complete sets, each set comprising one high-pressure ahead and one high-pressure astern turbine; one low-pressure ahead turbine, in which is incorporated one low-pressure astern turbine and one cruising turbine. The boilers are of the latest improved large-tube Yarrow type, adapted for either coal or oil fuel. During the speed trials the powers specified were easily exceeded, and although the sea was very rough while the battleship was run over the measured mile at Polperro, the designed speed of 21 knots and the specified shaft-horse-power of 24,500 was realised. Other trials included 30-hour runs at 20 and 70 per cent. of the full power, and eight hours at full power. The machinery was constructed by Messrs. R. and W. Hawthorn Leslie and Co., Ltd., the order having been promptly executed despite seven months' lost time during the engineers' strike on the north-east coast.

The first part of a general description of the engineering and constructional features of the Panama Canal, by Mr. G. W. Goethals, chairman and chief engineer of the Isthmian Canal Commission, appears in *Engineering* for February 11. Among other interesting items, we learn that dynamite is used for blasting, as excessive moisture and water in the holes prevent the use of blasting powder. An average of 1,000,000 lb. of dynamite per month is consumed for the entire work, and the number of accidents has been relatively small, although, owing to the number of men in contracted areas, the casualties have been great. Premature explosions, attributable to concussion during loading, led to the substitution of pine-rammers for those of lignum vitæ. Temperature tests are made prior to loading, as in some cases high temperatures exist in the holes. Unexploded charges, subsequently dug out by steam shovels, led to laying wires direct from electric-lighting plants to the cut in substitution for the ordinary magneto-electric machines operated by hand. The fuses are connected in parallel in lieu of in series, failures often occurring in the latter case, none in the former. No holes are now loaded which cannot be fired the same day, a precaution necessitated by the premature explosion of 22 tons of 45 per cent. dynamite at Bas Obispo, probably owing to some of the nitroglycerine having been liberated and exploded by concussion by a dobie shot in the vicinity. Accidents have occurred during electric storms, and the only possible precaution is now taken by stopping work.

The evidence given at the Board of Trade inquiry into the Stoat's Nest accident on the London, Brighton and South Coast Railway shows that the left-hand leading wheel of the coach which left the metals had been displaced from its true position on the axle by about one inch. This would be quite sufficient to cause an accident if the wheel had previously shifted, and there is reason to believe that this was the case, as the signalman had seen sparks flying from the bogie frame near this wheel before the accident occurred. Commenting on the evidence, *Engineering* for February 4 points out that in many cases too much reliance is put on the men in charge of the work of pressing wheels on to the axles. A great deal of care is taken by the railway companies, and only experienced men are chosen for this work; but the foremen cannot witness every operation, and there may be a tendency for workmen to pass wheels which have been pressed on at figures barely reaching the required limit. The pressure used in the case of the wheel above mentioned was stated in evidence as sixty tons. It is of interest to note that, at the Horwich works of the Lancashire and Yorkshire Railway, an autographic record is drawn by the press during each operation. Such a record is invaluable as a check on the workmen, and enables the foreman to deal promptly with cases of poor work before the wheels leave the shop. The *Engineer* for February 4, commenting on the accident, says that facing points as now constructed are not dangerous, and that diamond crossings are a source of danger. It is suggested that the accident may have been caused by the wheel, which was wide to gauge, striking the diamond crossing which exists at the place where the accident occurred.

Prof. W. H. Hussey contributes to the January Bulletin of the American Mathematical Society tables of Galois fields of order less than 1000.

In the *Rendiconto* of the Naples Academy (3), xv., 3, 4, Dr. Paolo Rossi discusses the nature of the secondary radiations of X-rays and their dependence on the substance which emits them. A property is referred to, analogous in some respects to Stokes's law of fluorescence.

Messrs. Hoepli, of Milan, have issued the fifth and last volume of Brioschi's collected mathematical works, at the price of 30 francs. This volume contains papers contributed to French, German, and English mathematical and scientific journals.

Messrs. John Wheldon and Co., of 38 Great Queen Street, Kingsway, London, have issued a classified entomological catalogue, comprising some 1400 books and papers they have on sale. We notice that the list includes some recent purchases and selections from various entomological libraries.

The ten numbers of the "Bulletin of Miscellaneous Information," issued during 1909 from the Royal Botanic Gardens, Kew, and noticed already from time to time in Nature, have been published in volume form. Like other Government publications, the book may be obtained, directly or through any bookseller, from Messrs. Wyman and Sons, Ltd., Fetter Lane, London. Its price is 3*s.* 6*d.*

A SECOND edition of Prof. Wilhelm Ostwald's "Grosse Männer" has been published by the Akademische Verlagsgesellschaft of Leipzig. It will be remembered that the first edition of the work was reviewed at length in our issue of July 29, 1909 (vol. lxxxi., p. 121). The price of the volume is 14 marks.

OUR ASTRONOMICAL COLUMN.

COMET 1910*a*.—Reports received from various observers show that at the beginning of this week comet 1910*a* was no longer a striking naked-eye spectacle, and there is little that is new to record regarding it.

Mr. Gustave Gillman sends us a fine drawing showing the comet's position and the extent of its tail as seen by him at Aguilas, Murcia, Spain, on January 27 and 31. For the former date the drawing, which is a large-scale chart of the region of stars wherein the comet was then located, shows, distinctly, the tail extending to ζ Pegasi, making its length more than 20°; but unfortunately the chart is unsuitable for reproduction here.

In *La Nature* for January 29 (No. 1914) M. Lucien Rudaux describes the comet as seen from Paris on January 21 and the succeeding days, and a drawing shows that it had a brilliant nucleus and a well-developed tail, several degrees long, on January 22. A number of observations are also recorded in the *Gazette astronomique* (No. 26), where attention is directed to the fact that if the apparent length of the tail on January 30 were 30°, the actual length was something like 110 million kilometres (68·75 million miles).

A number of drawings and photographs of the comet were shown at the meeting of the Royal Astronomical Society held on February 11. Among other remarkable features were the development of a shorter tail on the southern edge of the main tail, near the head, and the considerable extension of the main tail at its N.E. extremity; this extension curved quite abruptly from the main axis, and reached nearly to γ Pegasi. Mr. Hinks, who showed a number of drawings, directed attention to the fact that the bright nucleus was situated on the extreme inner edge of the head, so that the two branches of the tail appeared to enwrap it completely on the sunward side. The drawings also depicted the zodiacal light, with which the tail appeared to merge, thus forming a magnificent spectacle. Observations are also recorded in No. 6 of the *Comptes rendus* (February 7). MM. Luizet and Guillaume state that on January 29 and 30 the tail was 30° long, and, at a distance of 15° from the nucleus, its breadth was 2°; on January 31 it was distinctly fainter. MM. Javelle, Charlois, and Schaumasse report that on January 25 the nucleus was round and $10''$ in diameter, and two aigrettes, symmetrical with regard to it, were distinctly seen. On February 1 the comet was sensibly fainter, and the aigrettes were no longer visible, whilst a further diminution of brightness was recorded on February 2, and the nucleus was seen to be elongated. M. Borrelly records that on February 3 the side of nucleus nearer the sun was nearly devoid of coma.

THE MAGNETIC STORM OF SEPTEMBER, 1909, AND SOLAR PHENOMENA.—The connection between the magnetic storm of September 25, 1909, and the contemporaneous solar phenomena observed at the Meudon Observatory is discussed by M. Deslandres in a paper which appears in No. 2 of the *Comptes rendus*. A spectroheliogram of the upper hydrogen atmosphere, on September 24 4h. 35m. p.m., shows strong dark *filaments* connected with the spots, the areas of the latter being greatly diminished. At 9h. 3m. a.m. on September 25 these *filaments* had nearly disappeared, and were broken up, and M. Deslandres connects this phenomenon with that of the magnetic storm. A photograph of the "mean layer" of calcium on September 24 shows the eastern spot to be bordered, on its eastern side, with alternate bright and dark filaments, polygonal in form and sharply defined, and a number of similarly shaped flocculi join the two spots. M. Deslandres names this special structure *le réseau chromospherique,* and supposes that it shows the region on the western side of the spot to be in a fairly calm state. Photographs taken for that purpose, on September 24, give no evidence of motion in the line-of-sight, but show the bright vapours above the eastern spot discussed by Dr. Lockyer.

M. Deslandres discusses the several theories as to the solar-terrestrial connection, and shows that the "kathode radiation" theory may explain many of the phenomena. The kathode rays leaving the spot are curved, by the exterior magnetic field of the sun, like the spires of nebulæ, and this may account for the mean "lag" of forty-five hours between the meridian-transit of the spot and the incidence of the magnetic storm. The "whirls" of Prof. Hale thus become the effect, rather than the cause, of the magnetic field, which by M. Deslandres's theory is produced by the corpuscles circulating round the sun with great velocities. The difference between the calcium and hydrogen images is also explained by this theory, for the action of the field would produce different results on atoms of different masses.

THE INTRINSIC LIGHT OF THE SKY.—An interesting method of comparing the intrinsic light of various parts of the sky *inter se* and with stars of known magnitude is described by M. Ch. Fabry in a paper appearing in No. 5 of the *Comptes rendus* (January 31, p. 272).

In the focal plane of an objective of 48 cm. focal length M. Fabry placed a circular diaphragm of variable aperture. Passing through this aperture, the light of the sky fell upon an optical system, of 3·15 cm. focal length and large aperture, which projected an image of the objective on to a photographic plate. Thus the plate registers, as a uniformly illuminated circular area, the whole of the light coming from that part of the sky of which the image is formed behind the diaphragm. In making a determination, two exposures are necessary:—(1) the camera is directed to a star, *e.g.* Polaris, and the diaphragm is closed down so that only the light from the star is allowed to reach the plate; (2) the camera is directed to the region of the sky to be investigated, and the diaphragm opened so that an exposure of equal duration will give an image of equal density to that produced in the first case; a simple calculation then gives the ratio between the intrinsic illumination of the area under consideration and the light of the chosen star.

By this method M. Fabry finds that a square degree of sky, in galactic latitude 30° and near the pole, gives a photographic intensity equal to 0·103 that of Polaris, or 0·92 that of a fifth-magnitude star. The corresponding ratios for an area, of one degree square, between β and γ Cygnus, one of the brightest regions of the Milky Way, are 0·212 and 1·9 respectively. These values differ from those obtained by visual observations, probably because the magnitude of Polaris was taken as 2·62, but if the visual magnitude of the latter is taken, 2·12 on the Harvard scale, the result for 1 square degree of non-galactic sky is 1·46 of a fifth-magnitude star, a value intermediate between those obtained by Newcomb (1·15) and Burns (2·0). As regards the ratio between galactic and non-galactic sky, M. Fabry's results are in accord with the visual observations.

ELLIPTIC ELEMENTS AND AN EPHEMERIS FOR DANIEL'S COMET, 1909*e*.—From observations made at Rome and Nice on 1909 December 8 and 1910 January 2 and 14, Dr. Ebell has calculated elliptic elements for the orbit of Daniel's comet, 1909*e*, which he publishes, with an ephemeris, in No. 4384 of the *Astronomische Nachrichten* (p. 264). The elements give 1909 November 28·91228 (Berlin) as the time of perihelion passage, and 6·403 years as the period, but they are not yet considered final. According to the ephemeris, the comet is now (February 17) 58m. east and 38′ north of δ Aurigæ, and is only about one-fifth as bright as it was on December 8; its daily motion is slightly less than 2m. nearly due east.

PUBLICATIONS OF THE LUND OBSERVATORY, SWEDEN.—From the Lund Observatory, Sweden, we have received three papers, published as *Meddelanden från Lunds Astronomiska Observatorium*. No. 5 (series ii.) is by Prof. Charlier, and discusses the motions of the orbit-planes of satellites in various planetary systems. In No. 6 M. Henrik Block discusses a class of singularities in the problem of *n* bodies, and in No. 40 (first series) Dr. Zinner treats of the secular perturbations in the planetary rotation problem.